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REMARKS/ARGUMENTS

Claims 1-25 and 49-70 are pending in this application. Claims 4, 7, 11, 12, 20, 23, 62, 64, and 65 were amended and new claims 67-70 were added to more distinctly claim the invention. Claim 11 has been amended to correct a typographical error. Support for the new and amended claims can be found in the specification. No new matter has been added.

Claim Rejections - 35 U.S.C. § 103

Claims 1-25 and 49-66 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. patent 5,866,949 to Schueler in view of U.S. patent 6,246,010 to Zenner *et al.* (hereafter Zenner), U.S. patent 5,160,560 to Welkowsky *et al.* (hereafter Welkowsky), and the admitted prior art. Applicants respectfully disagree with the grounds for these rejections. Reconsideration of the rejections and allowance of the pending claims are respectfully requested.

Claim 1

As an initial matter, the examiner is reminded that the mere fact that references can be combined does not render an invention obvious, unless there is something in the prior art that also suggests the modification. See MPEP § 2143.01. In the present case the examiner has not pointed to any specific portion of the Schueler reference, or the other pieces of prior art, that suggests the combination of references the rejection relies upon in arguing claim 1 is unpatentable. Instead, the examiner argues that it is within the capabilities of a skilled artisan to have made the modification (incorporation of a silicon die with a first thickness less than a second thickness associated with a transition medium) "so that the thermal stress can be reduced and the functionality/reliability of the package can be improved." (Office Action at page 3, last paragraph).

Applicants respectfully assert that rather than suggesting this modification or combination, the cited references teach away from a combination with each other.

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Accordingly, applicants respectfully assert that the combinations asserted by the examiner are improper.

Zenner Teaches Away From a Combination With Schueller

Rather than improving "the functionality/reliability of the package," as discussed by the examiner (Office Action at page 3, last paragraph), a combination of Zenner and Schueller would destroy the flexibility utilized by Zenner to reduce stress in the package. Because Zenner specifically teaches away from the use of chip scale ball grid arrays with solder balls greater than 100 μm in diameter (which is the size used by Schueller), a person of ordinary skill in the art would not be motivated to combine the chip scale ball grid array approach of Schueller with the ultra-thin package approach of Zenner.

Zenner appears to provide a thin adhesive layer and a thin die so as to achieve a thin and flexible package. "The overall thinness of the circuit packages 10 and electronic packages 20 of the present invention reduce stress that may be introduced into the packages during the bonding process," since the entire package can bend. (Zenner at col. 4, line 66 to col. 5, line 17, emphasis added). Schueller discusses a standard thickness chip scale ball grid array package with solder balls "most typically between about 300 microns and about 600 microns" in height. (Schueller at col. 7, line 66 to col. 8, line 2).

Zenner considers the chip scale ball grid array disclosed by Schueller as unsatisfactory. Zenner teaches that although techniques such as bonding to chip scale ball grid arrays "could conceivably be performed using thin chips (50 μm or less silicon thickness) they remain handicapped by the stand-off limits of greater than 100 μm in height that will prevent the production of an ultra-thin package." (Zenner at col. 1, line 65 to col. 2, line 3, Certificate of Correction, emphasis added). Therefore, a combination of Schueller's package with Zenner's thin die, as suggested by the examiner, would result in the loss of the flexibility that Zenner's ultra-thin package utilizes to reduce stress

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resulting from packaging. Consequently, rather than providing a motivation to combine the references, Zenner teaches away from a combination with Schueller.

Zenner Focuses on a Flexible Package; Schueller Focuses on a Rigid Package

Zenner discusses a design in which the entire package is able to flex and bend. Schueller, on the other hand, purposely uses the rigid and planar surface of a nonpolymer support structure to produce a rigid package. Schueller does not teach or suggest the use of Zenner's thin die, because, rather than increasing package rigidity, the thin die discussed by Zenner would increase package flexibility. Therefore, applicants assert that the motivation to combine these references is lacking.

Zenner discusses "a flexible electronic circuit package" that retains its flexibility after assembly, enabling the package to conform to nonplanar surfaces. (Zenner at col. 2, line 9, lines 21-22, and lines 64-66). Rejecting package flexibility, Schueller discusses a concern for chip scale package (CSP) flatness. "In a typical CSP design, it is critical that the package flatness (coplanarity) be less than about 25 μm (1 mil) to ensure that all solder balls contact the PCB upon reflow." (Schueller at col. 2, lines 45-49, emphasis added). Accordingly, Schueller discusses a design in which "a nonpolymer support structure (or pad) is used between a semiconductor device or integrated circuit (such as a semiconductor die) and accompanying circuitry to provide a substantially rigid and planar surface." (Schueller at col. 6, lines 58-62, col. 7, lines 1-3, emphasis added).

Therefore, rather than suggesting a combination of references, Zenner and Schueller discuss packages with fundamentally different characteristics. In fact, the thin semiconductor die used by Zenner is used to produce a package with increased flexibility, something specifically disparaged by Schueller. Therefore, applicants respectfully submit that these references provide no motivation to suggest a combination .

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Schueller Teaches Away From a Combination With Welkowsky

Welkowsky discusses a "silicon liquid crystal light valve" that utilizes a very thin silicon wafer, mounted so that the silicon wafer is directly "bonded to a glass substrate using an electrostatic bonding technique." (Welkowsky at col. 1, lines 24-31 and col. 3, lines 23-26, emphasis added). This direct bonding technique is dismissed by Schueller as unacceptable prior art. Therefore, Schueller teaches away from a combination with Welkowsky.

Specifically, Schueller discusses the Texas Instruments "Micro Star BGA" package, in which "an IC is adhered, directly to the surface of a flex circuit without a polymer or elastomer pad" as unacceptable prior art. (Schueller at col. 3, lines 19-22, emphasis added). Rejecting the direct bonding technique of Welkowsky, Schueller discusses a package in which "a nonpolymer support structure (or pad) is used [] to separate or decouple the die from a substrate." (Schueller at col. 6, lines 58-62, emphasis added).

Therefore, Schueller teaches away from a combination with Welkowsky by dismissing packages that utilize direct bonding as unacceptable. Applicants respectfully submit that since the direct bond of Welkowsky precludes the artisan from achieving the methods (and benefits) taught by Schueller, namely decoupling of the die from the substrate, a person of ordinary skill in the art would not be motivated to combine these references.

Accordingly, applicants respectfully assert that the combination of the Schueller reference with either the Zenner or Welkowsky reference is improper. For at least these reasons, applicants respectfully submit that the claimed invention is patentably distinct from the prior art. Accordingly, applicants respectfully request withdrawal of the Section 103 rejection and the allowance of claim 1.

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Claims 2-19

Claims 2-19, which depend from claim 1 are considered to be in a condition for allowance for at least the reasons given above, and for the additional limitations they recite.

The language of claim 7 has been amended to more distinctly recite the claim limitations. Support for the claim amendment is found, for example, in the Specification at page 9, line 32 to page 10, line 12 and in Fig. 7. Amended claim 7 recites, in part, "wherein the silicon die is disposed at a location approximately equally spaced from the bottom of the metallized polymer layer and the top of the plastic encapsulant." As discussed below, applicants respectfully submit that the arguments used by the examiner in rejecting claims 1 and 7 are inconsistent with each other. Consequently, based on the inconsistency of the arguments used in the office action, applicants request the examiner withdraw the rejection of claim 7.

In regard to applicant's arguments regarding the allowability of claim 1, filed on 11/13/02, the examiner stated that the "Figures in Schueller do not indicate/represent the numerical values of the dimensions/thickness for the die or the molded package." (Office Action at page 16, third paragraph). However, in rejecting claim 7, the examiner referred to Fig. 3B of Schueller in arguing that "Schueller discloses the die being disposed near the middle of a package." (Office Action at page 6, middle paragraph). Since Schueller makes no disclosure regarding the thickness of the encapsulant 86, the examiner is evidently assuming that Fig. 3B is drawn to scale.

Applicants respectfully submit that the office action is inconsistent in rejecting claim 1 in reliance on the figures not being drawn to scale and rejecting claim 7, which depends on claim 1, in reliance on the figures being drawn to scale. Applicants respectfully submit that if the examiner continues to rely on the figures not being drawn to scale in rejecting claim 1, the rejection of claim 7 relying on the opposite assumption should be withdrawn.

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Applicants submit that none of the cited references teach or suggest an integrated circuit package comprising a metallized polymer layer, a plastic encapsulant, and a silicon die, in which the silicon die is disposed at a location approximately equally spaced from the bottom of the metallized polymer layer and the top of the plastic encapsulant. Accordingly, applicants submit that claim 7 is in a condition for allowance.

Claims 20-24

Claim 20 has been amended to more distinctly recite the claim limitations. Amended claim 20 recites, in part, "wherein the die is disposed near a midline of the package thickness measured from the bottom of the metallized polymer layer to the top of the mold cap." For at least the reasons given above in relation to amended claim 7, and for the additional limitations recited, applicants believe claim 20 is in a condition for allowance.

Claim 21 recites, in part, "wherein the mold cap has a coefficient of thermal expansion similar to a coefficient of thermal expansion of the transition medium." (emphasis added). Schueller teaches away from the claimed invention since he is concerned with the CTE of the substrate, not the mold cap.

According to an embodiment of the present invention, similarity between the CTEs of the mold cap and the transition medium "provides [for] a more uniform contraction and expansion of the die packaging." (Application at page 9, line 30). Schueller, on the other hand, states that "Typically, a nonpolymer support structure having a coefficient of thermal expansion (CTE) close to that of the substrate is employed to minimize thermal stress effects on solder joints." (Schueller at col. 6, line 67 to col. 7, line 3). Therefore, rather than using a transition medium with a CTE similar to that of the mold cap, Schueller uses a support structure with a CTE similar to that of the substrate. Consequently, applicants submit that Schueller teaches away from the claimed invention.

For at least these reasons, as well as for the reasons discussed in relation to claim 20, applicants believe dependent claim 21 is in a condition for allowance. Claims

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22-24, which depend from claim 20 are also believed to be in a condition for allowance, for at least the reasons given above, and for the additional limitations they recite.

Claim 25

Claim 25 recites, in part, "wherein the thickness of the adhesive layers, transition medium and die is nearly equivalent to or the same as half of the package thickness." For at least the reasons given above in relation to amended claim 7, and for the additional limitations recited, applicants believe claim 25 is in a condition for allowance.

Claims 49-61

Claim 49 recites, in part, "wherein the transition medium has a second thickness, greater than the first thickness [of the integrated circuit die]." For at least the reasons discussed above in relation to claim 1, independent claim 49 is in a condition for allowance. Dependent claims 50-61 are also believed to be in a condition for allowance, for at least these reasons, and for the additional limitations they recite.

Claims 62-66

Amended claim 62 recites, in part, "wherein the transition medium comprises a thickness that is greater than the thickness of the silicon die and the coefficient of thermal expansion of the transition medium is approximately equal to that of the plastic encapsulant." (emphasis added). For at least the reasons discussed above in relation to claims 1, 7, and 21, and for the additional limitations recited, independent claim 62 is believed to be in a condition for allowance. Dependent claims 63-66 are also believed to be in a condition for allowance, for at least these reasons, and for the additional limitations they recite.

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Added Claims

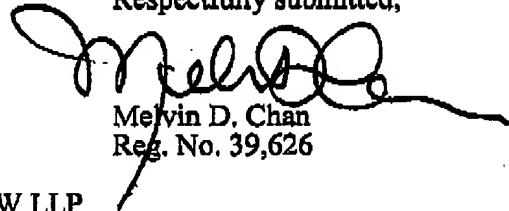
To more fully claim the novel aspects of the present invention, applicants have added claims 67-70. Applicants believe these new claims are allowable for at least the reasons given above and for the additional limitations they recite.

CONCLUSION

In view of the foregoing, applicants believe all claims now pending in this application are in condition for allowance. The issuance of a formal notice of allowance at an early date is respectfully requested.

If the examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400, extension 5213.

Respectfully submitted,



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Client Ref. No.: A515

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ATTENTION: Examiner Nitin Parekh
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Documents Attached

1. SB/21 Transmittal	1 page
2. Amendment Under 37 CFR 1.116	17 pages
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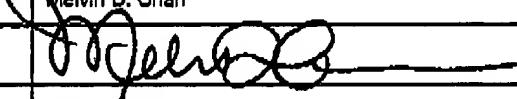
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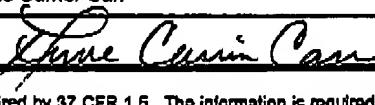
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